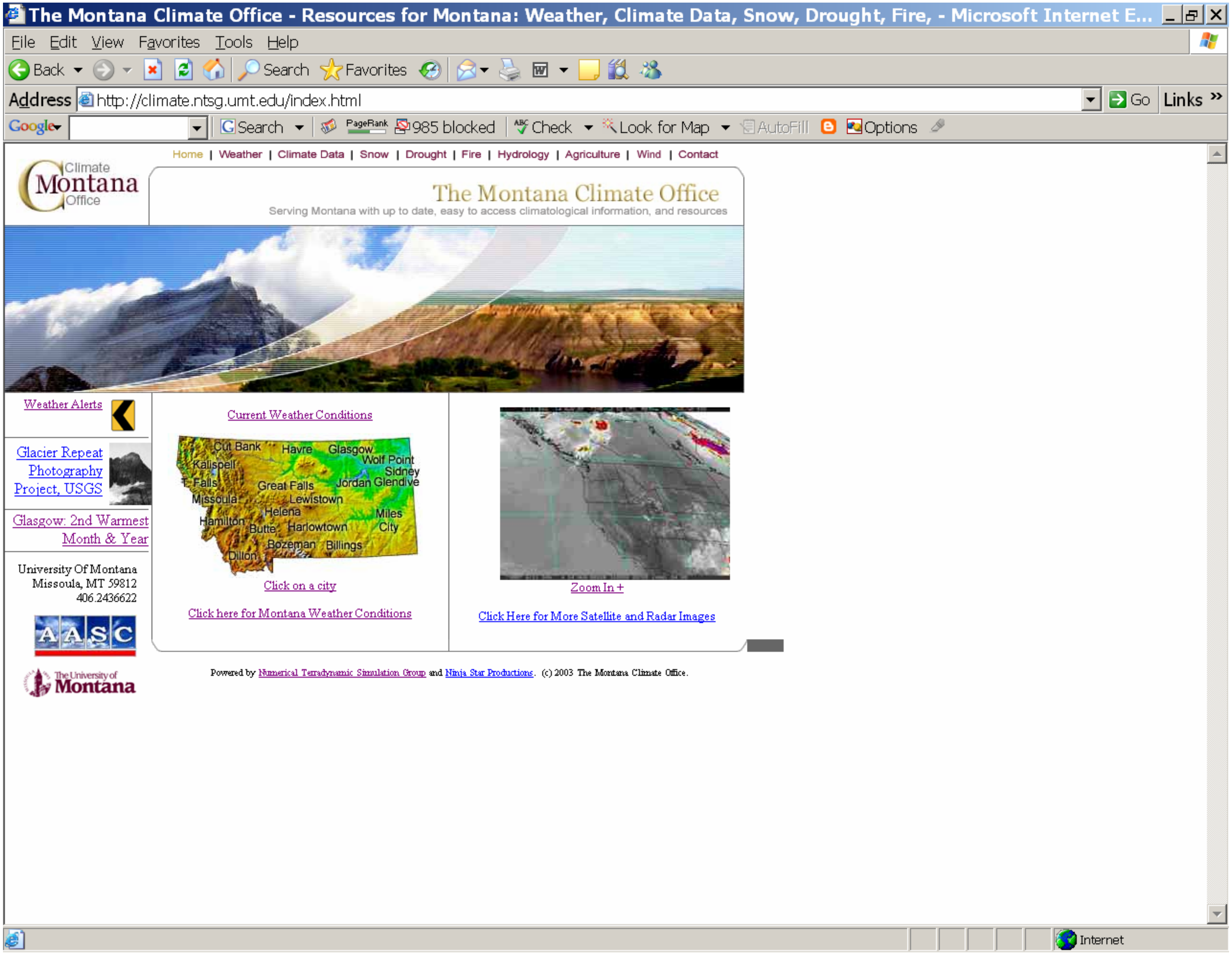
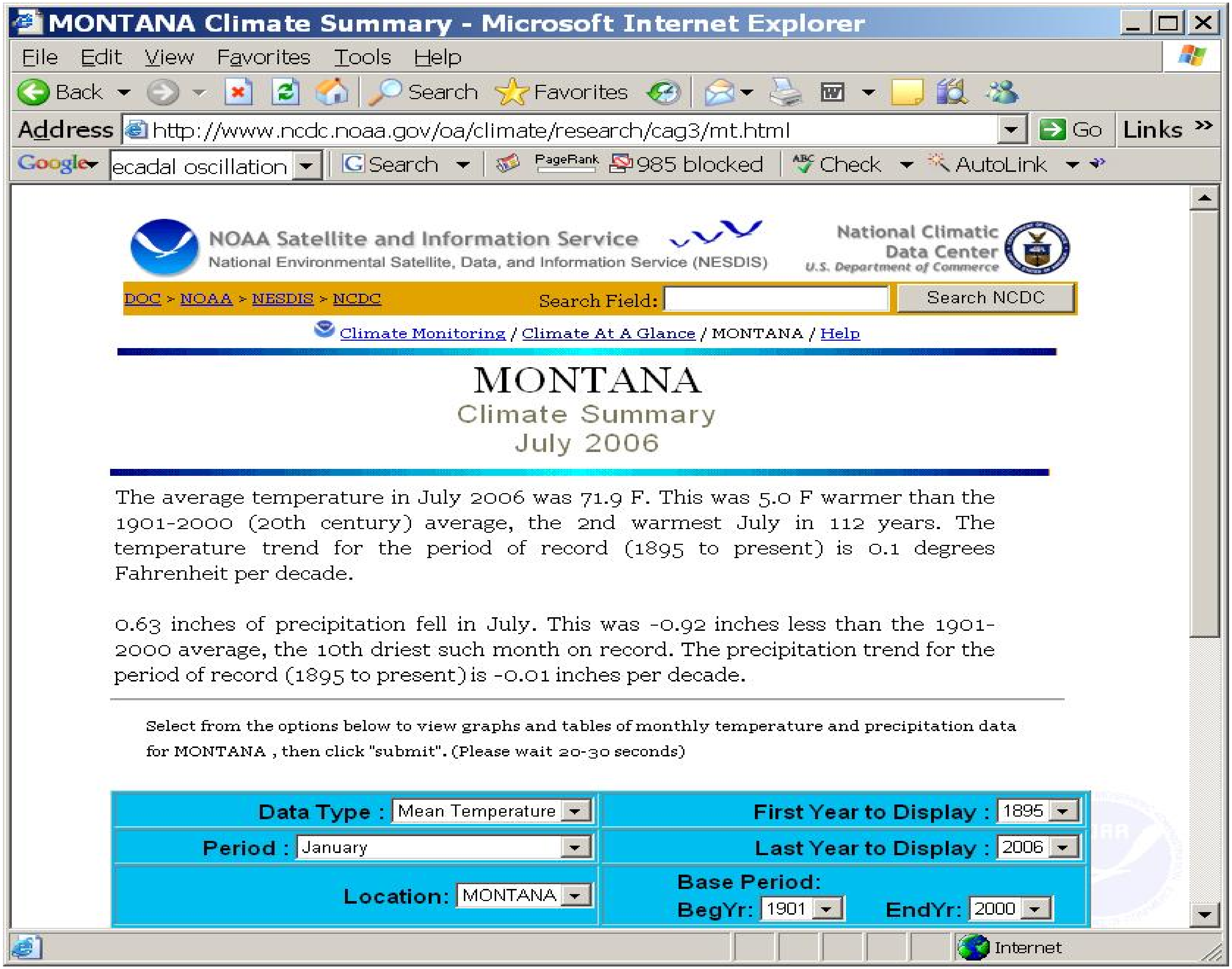
What’s up with all the heat?

Is there a Smoking Gun?

Don Potts, State Climatologist
College of Forestry and Conservation
The University of Montana, Missoula

Montana Climate Office


The Montana Climate Office - Resources for Montana: Weather, Climate Data, Snow, Drought, Fire, - Microsoft Internet E...
File Edit View Favorites Tools Help
Back Search Favorites
Address http://climate.ntsg.umt.edu/index.html
Go Links
Google Search PageRank 985 blocked Check Look for Map AutoFill Options
Home | Weather | Climate Data | Snow | Drought | Fire | Hydrology | Agriculture | Wind | Contact
Climate Montana Office
The Montana Climate Office
Serving Montana with up to date, easy to access climatological information, and resources
Weather Alerts
Glacier Repeat Photography Project, USGS
Glasgow: 2nd Warmest Month & Year
University Of Montana
Missoula, MT 59812
406.2436622
AASC
The University of Montana
Current Weather Conditions
Cut Bank
Havre
Glasgow
Wolf Point
Sidney
Kalispell
Falls
Great Falls
Jordan
Glendive
Missoula
Lewistown
Helena
Miles City
Hamilton
Butte
Harlowtown
Bozeman
Billings
Dillon
Click on a city
Click here for Montana Weather Conditions
Zoom In +
Click Here for More Satellite and Radar Images
Powered by Numerical Terradynamic Simulation Group and Ninja Star Productions. (c) 2003 The Montana Climate Office.
Internet


MONTANA Climate Summary - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://www.ncdc.noaa.gov/oa/climate/research/cag3/mt.html Go Links

NOAA Satellite and Information Service

National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center

U.S. Department of Commerce

DOC > NOAA > NESDIS > NCDC Search Field: Search NCDC

Climate Monitoring / Climate At A Glance / MONTANA / Help

MONTANA

Climate Summary
July 2006

The average temperature in July 2006 was 71.9 F. This was 5.0 F warmer than the 1901-2000 (20th century) average, the 2nd warmest July in 112 years. The temperature trend for the period of record (1895 to present) is 0.1 degrees Fahrenheit per decade.

0.63 inches of precipitation fell in July. This was -0.92 inches less than the 1901-2000 average, the 10th driest such month on record. The precipitation trend for the period of record (1895 to present) is -0.01 inches per decade.

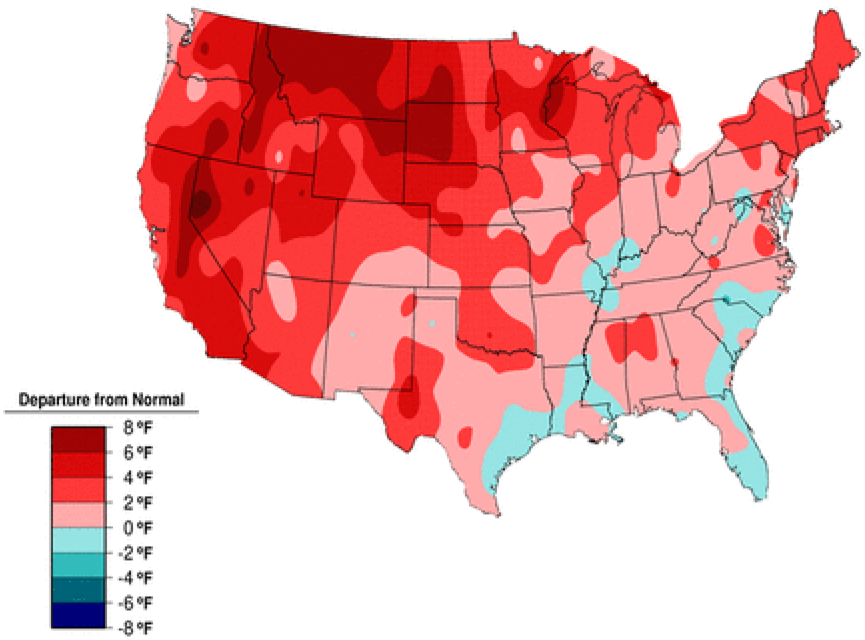
Select from the options below to view graphs and tables of monthly temperature and precipitation data for MONTANA , then click "submit". (Please wait 20-30 seconds)

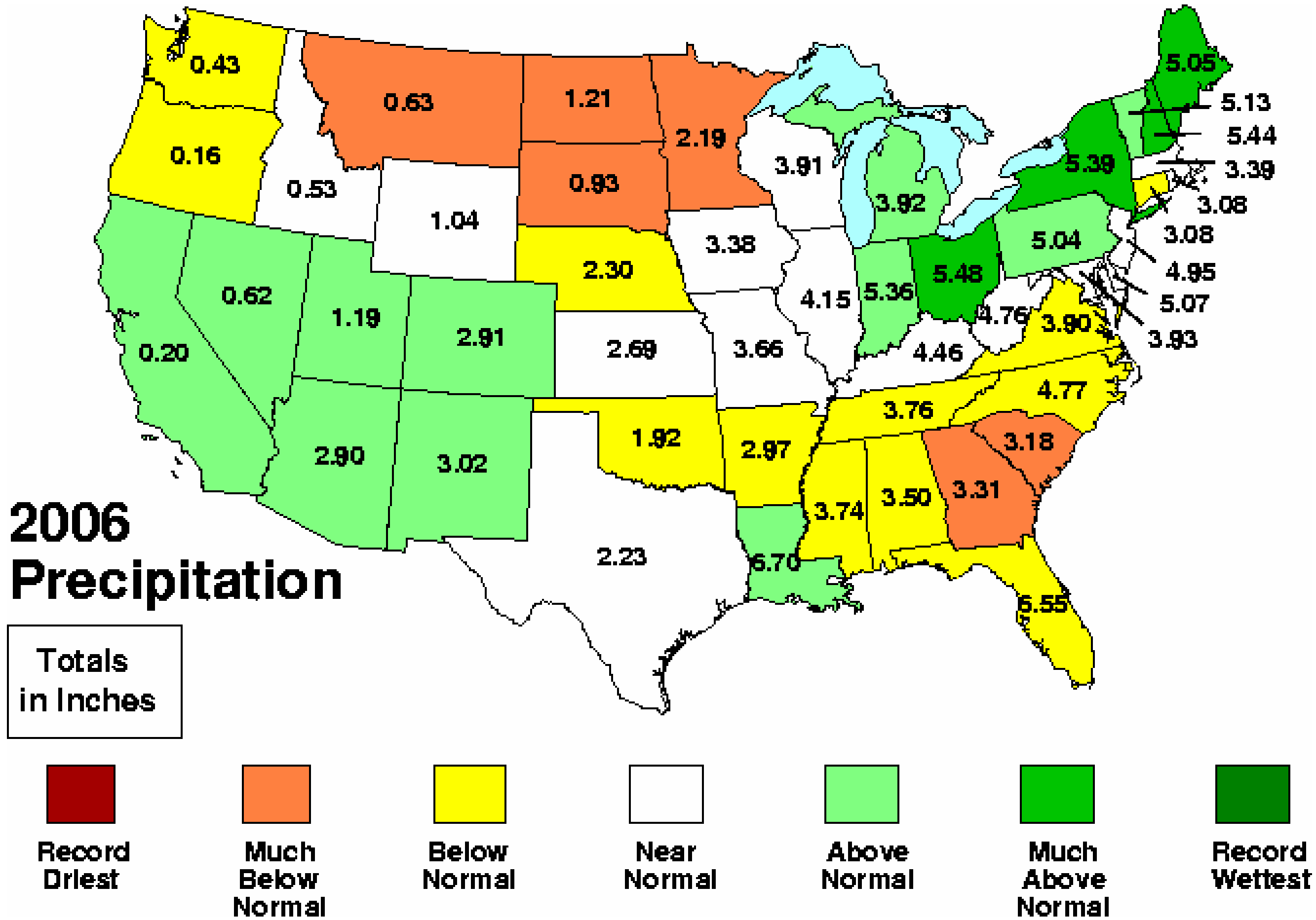
Data Type : Mean Temperature	First Year to Display : 1895
Period : January	Last Year to Display : 2006
Location: MONTANA	Base Period: BegYr: 1901 EndYr: 2000

Internet

July 2006 Temperature Departure from Normal

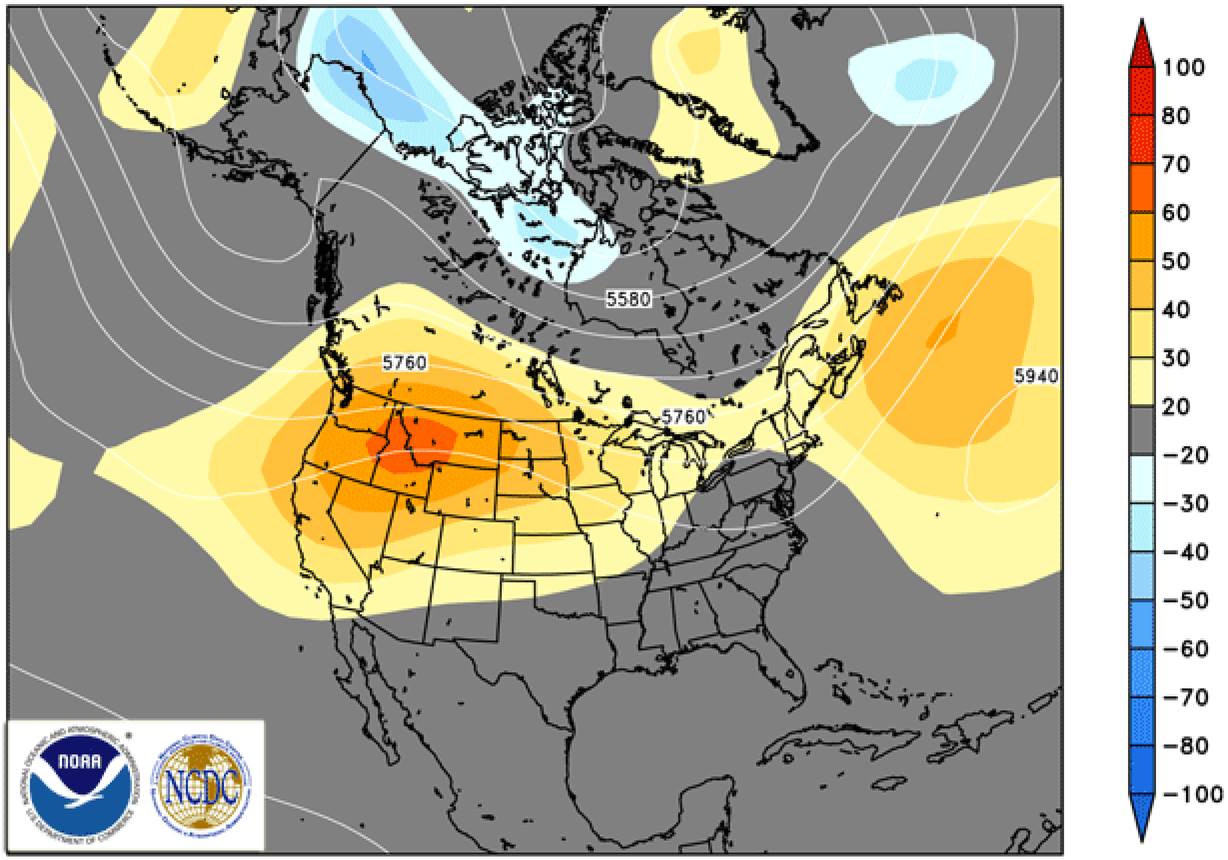
(Departure from the 1971 - 2000 Normal)



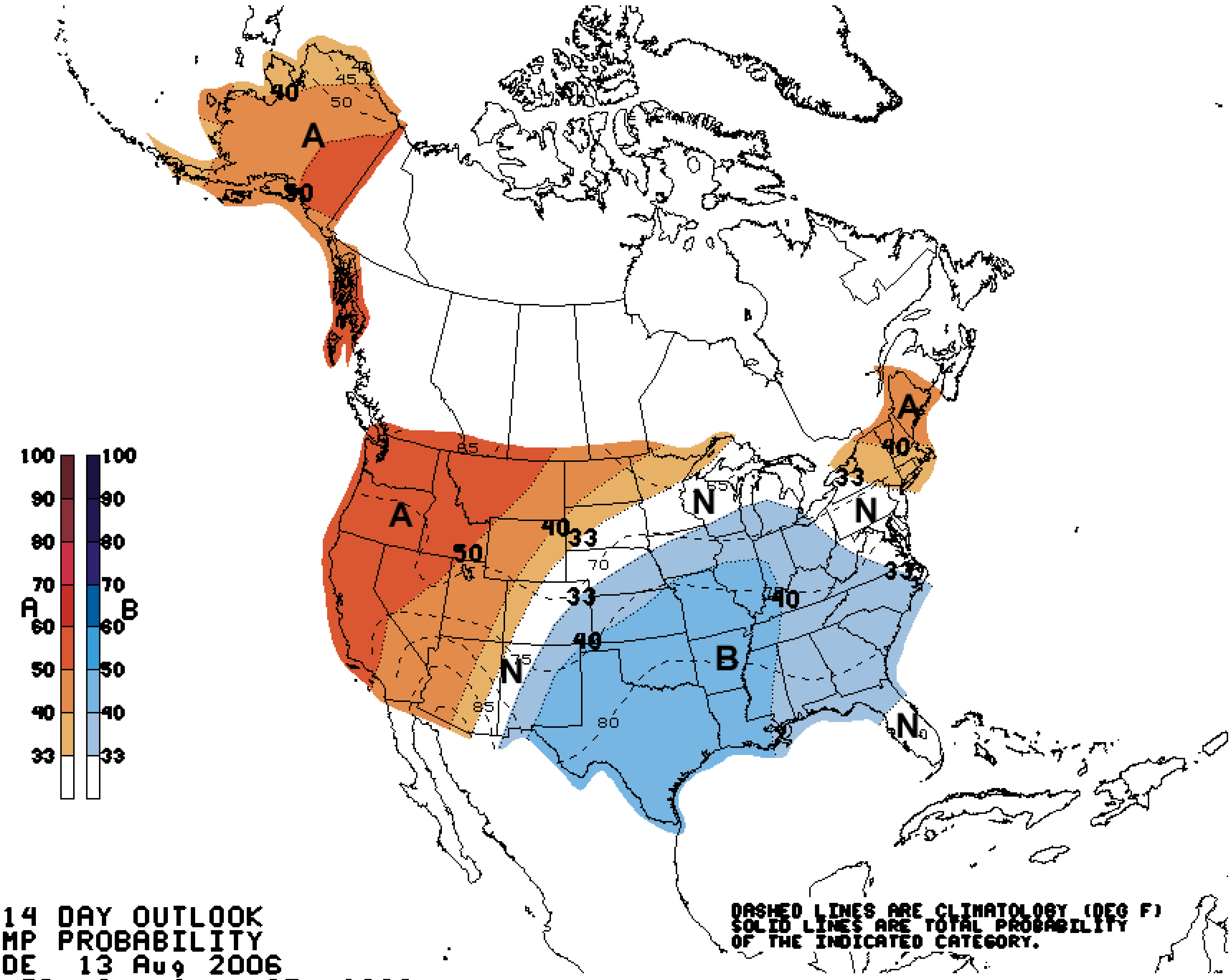


0.43
0.16
0.53
0.63
1.21
2.19
0.93
1.04
2.30
0.20
0.62
1.19
2.91
2.69
3.38
3.91
3.92
5.39
5.05
5.13
5.44
3.39
3.08
3.08
5.04
4.95
5.07
3.93
4.15
5.36
5.48
4.76
3.90
4.46
4.77
3.76
3.66
2.90
3.02
1.92
2.97
3.18
3.31
3.74
3.50
2.23
6.70
6.55
2006
Precipitation
Totals
in Inches
Record Driest
Much Below Normal
Below Normal
Near Normal
Above Normal
Much Above Normal
Record Wettest

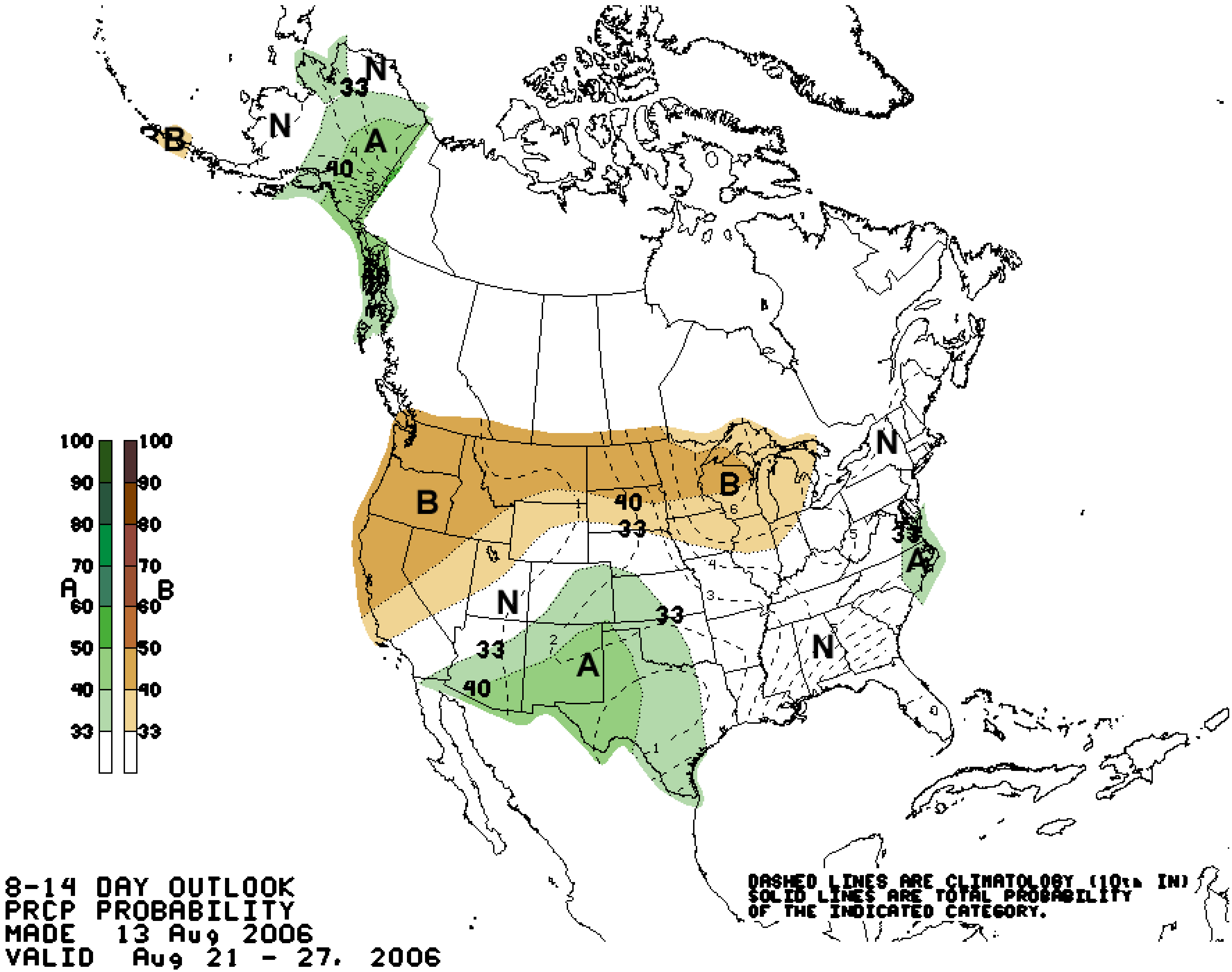
500 Millibar Heights and Anomalies (in meters)
(From NCEP Reanalysis)



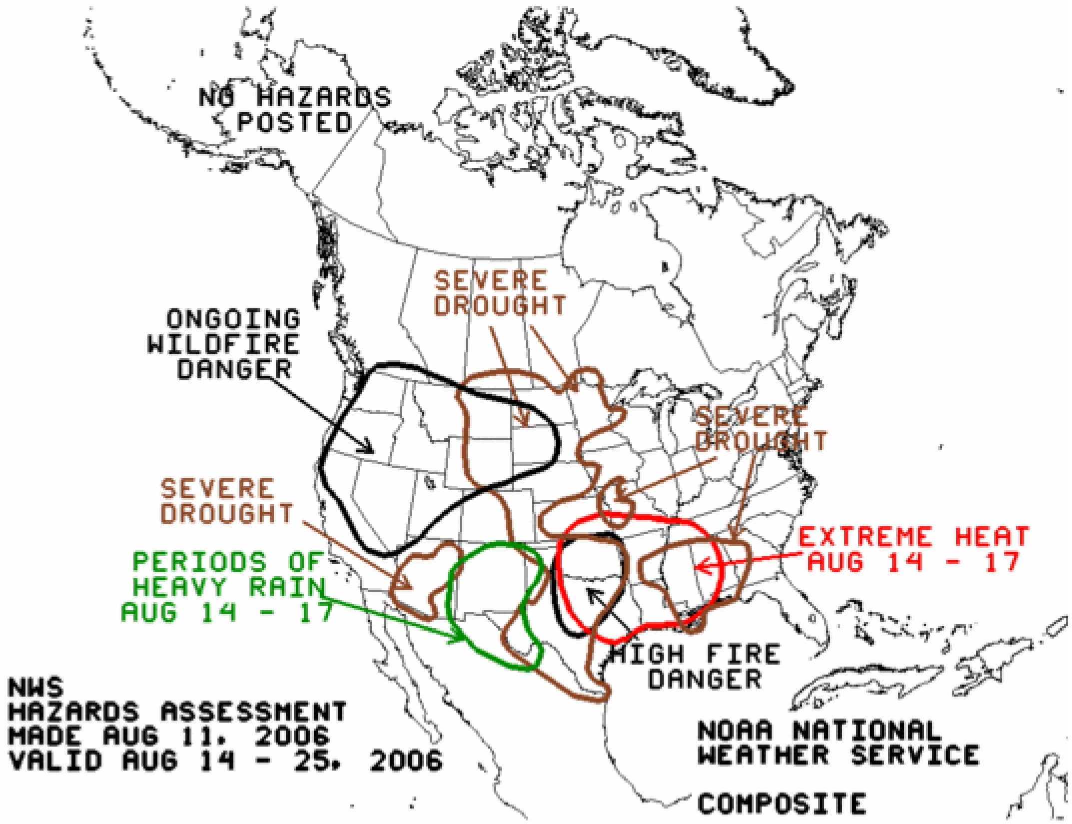
July 2006

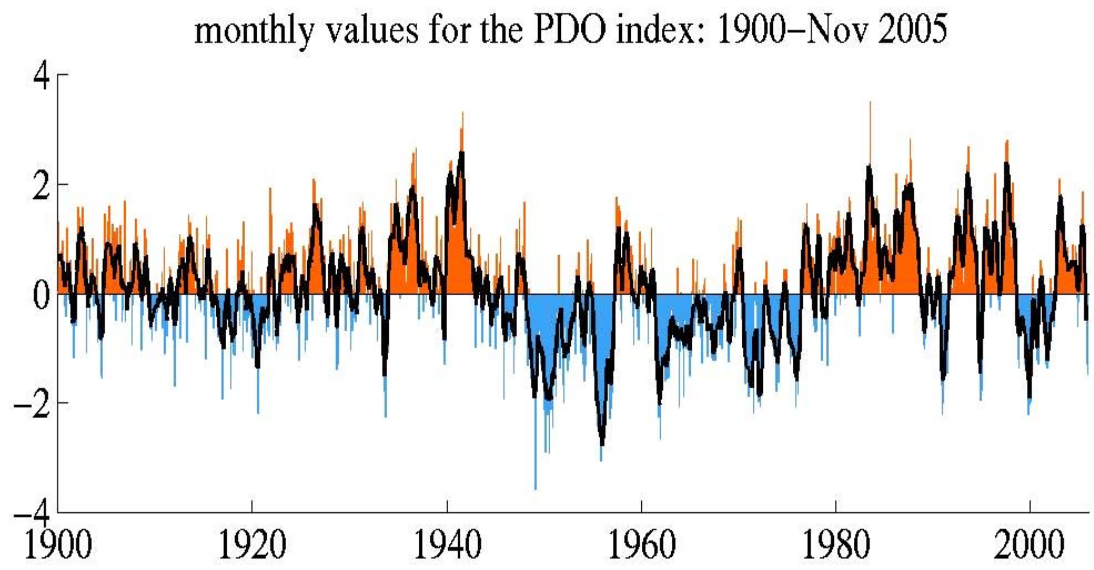


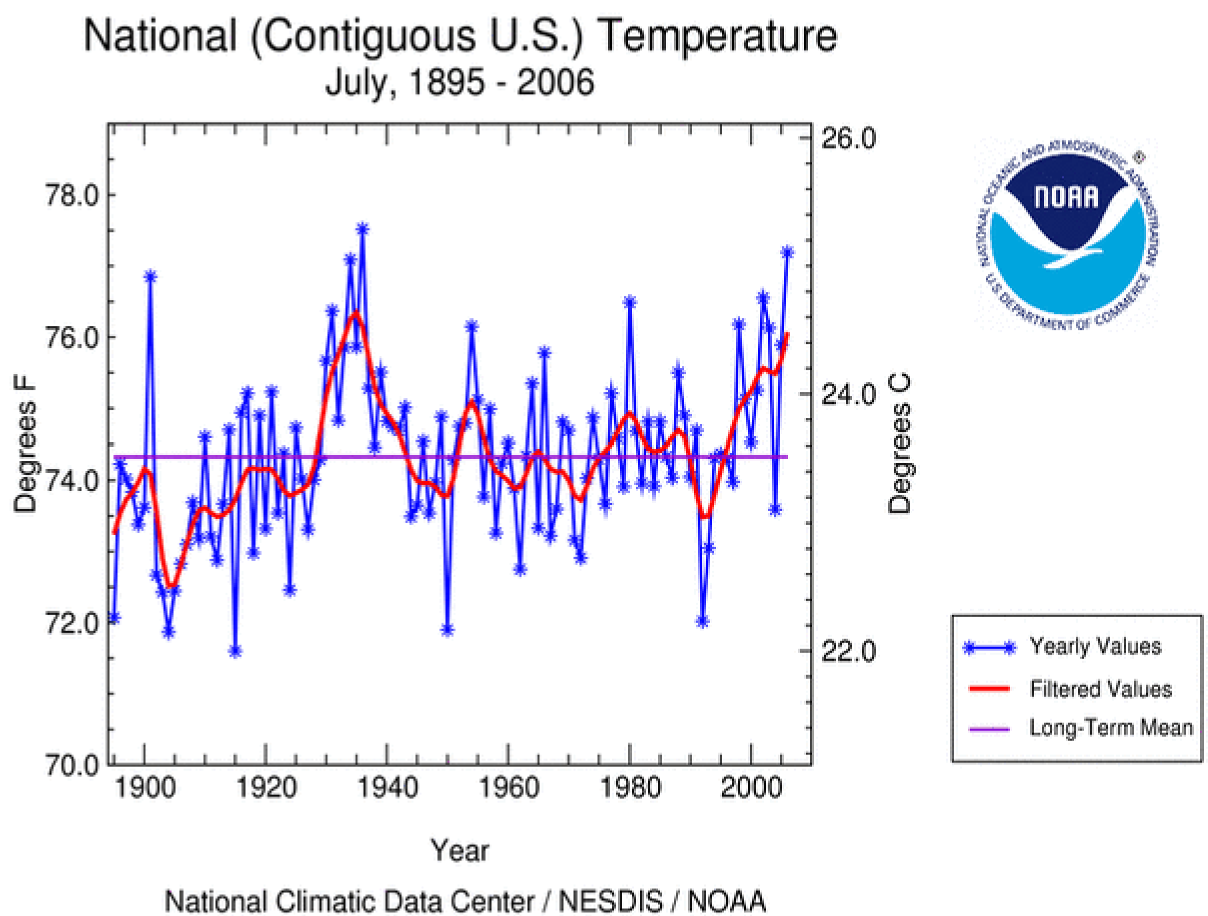
8-14 DAY OUTLOOK
TEMP PROBABILITY
MADE 13 Aug 2006
VALID Aug 21 - 27, 2006

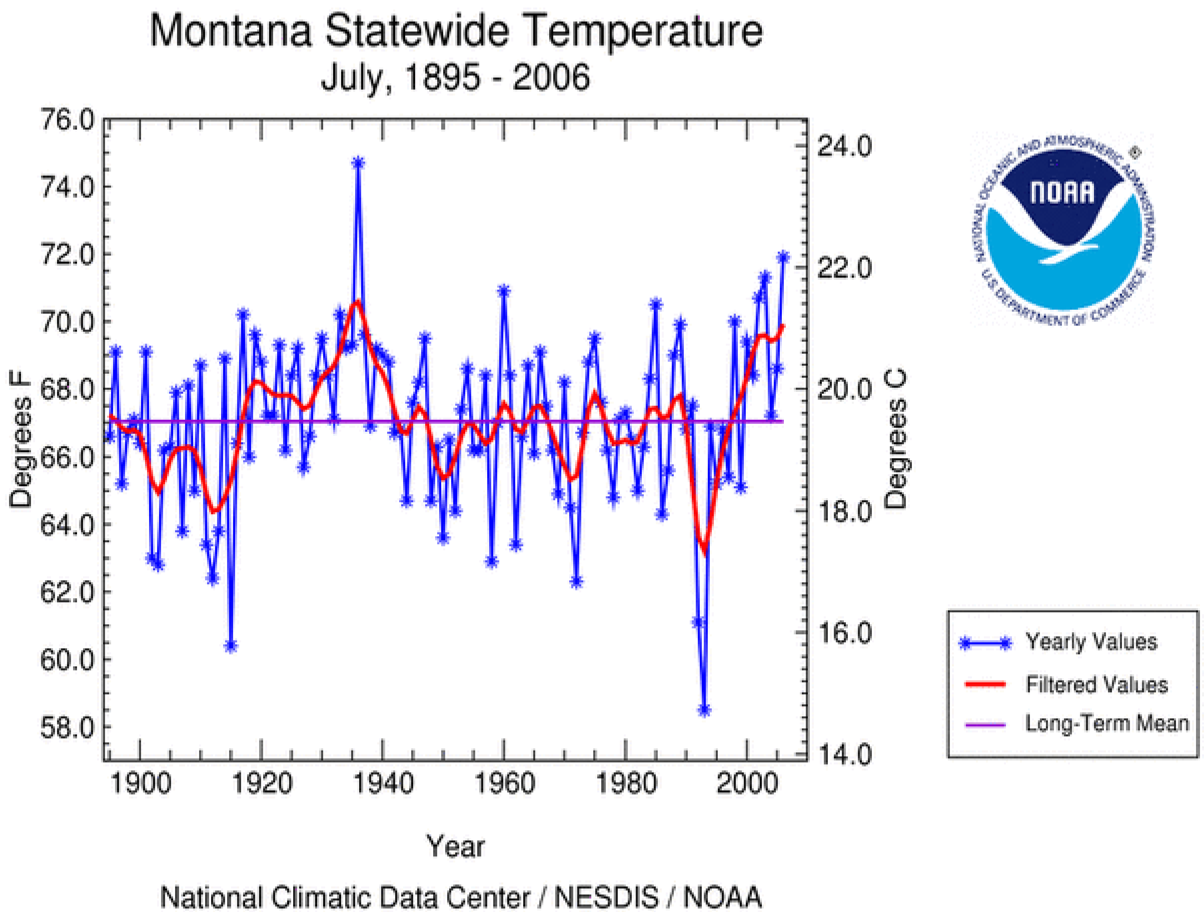


100
90
80
70
60
50
40
33
A
B
N
33
A
40
B
N
B
40
33
B
N
33
A
N
33
40
A
33
N
DASHED LINES ARE CLIMATOLOGY (10th IN)
SOLID LINES ARE TOTAL PROBABILITY
OF THE INDICATED CATEGORY.
8-14 DAY OUTLOOK
PRCP PROBABILITY
MADE 13 Aug 2006
VALID Aug 21 - 27, 2006


NO HAZARDS
POSTED
SEVERE
DROUGHT
ONGOING
WILDFIRE
DANGER
SEVERE
DROUGHT
SEVERE
DROUGHT
EXTREME HEAT
AUG 14 - 17
PERIODS OF
HEAVY RAIN
AUG 14 - 17
HIGH FIRE
DANGER
NWS
HAZARDS ASSESSMENT
MADE AUG 11, 2006
VALID AUG 14 - 25, 2006
NOAA NATIONAL
WEATHER SERVICE
COMPOSITE


monthly values for the PDO index: 1900−Nov 2005
4
2
0
−2
−4
1900
1920
1940
1960
1980
2000


National (Contiguous U.S.) Temperature
July, 1895 - 2006
Degrees F
Degrees C
Year
78.0
76.0
74.0
72.0
70.0
26.0
24.0
22.0
1900
1920
1940
1960
1980
2000
Yearly Values
Filtered Values
Long-Term Mean
National Climatic Data Center / NESDIS / NOAA


Montana Statewide Temperature
July, 1895 - 2006
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
Degrees F
24.0
22.0
20.0
18.0
16.0
14.0
Degrees C
1900
1920
1940
1960
1980
2000
Year
National Climatic Data Center / NESDIS / NOAA
Yearly Values
Filtered Values
Long-Term Mean

Login for Members
Username
Password
Go
Not a Member? Join Now
Members: Forgotten your Password?
Navigate the Atlas:
USES ISSUES ABOUT GEOGRAPHY
Related Knowledge (3)
1 SUB-TOPICS:
Climate Variability and Change @
3 RELATED TOPICS:
Major Oscillations
North Atlantic Oscillation
Weather and storm generation
Topic Overview
ID# : 12737
Visits: 1374
Added: 01-Jan-2000
Updated: 09-Dec-2003
E-Mail Topic link
Editors
Jennifer Perce
WMO
Murray Brown
Become a joint editor

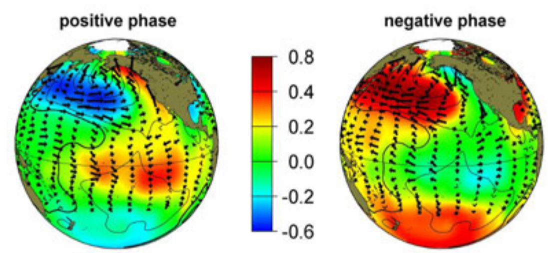
Pacific Decadal Oscillation

Maintained by IOC

The Pacific Ocean, the largest of the world's oceans, undergoes recurring, long-term swings in its temperature structure. These temperature shifts include a climate mode called the Pacific Decadal Oscillation, or PDO. It's an El Niño-like temperature shift, but it's more gradual and subtle (about 1- 2 degrees C over 15 - 30 years). Although the temperature change is smaller than that experienced during the El Niño/Southern Oscillation, the Pacific Decadal Oscillation occurs over a much larger area. The largest impacts of the PDO manifest themselves in the pattern of the jet stream across North America and in the dynamics of fishery ecosystems in the North-eastern Pacific. There are two phases associated with the PDO: the positive or 'warm' phase, and the negative or 'cool' phase.

It has been generally agreed upon that the Pacific Ocean has recently entered the cool phase of the PDO. In its negative, or "cool" phase, the PDO is a giant horseshoe-shaped arc of warmer-than-normal water symmetrical about the equator, that stretches from the Aleutians to the South Pacific and encloses a large wedge-shaped area of cooler-than-normal water in the eastern Pacific.

Pacific Decadal Oscillation

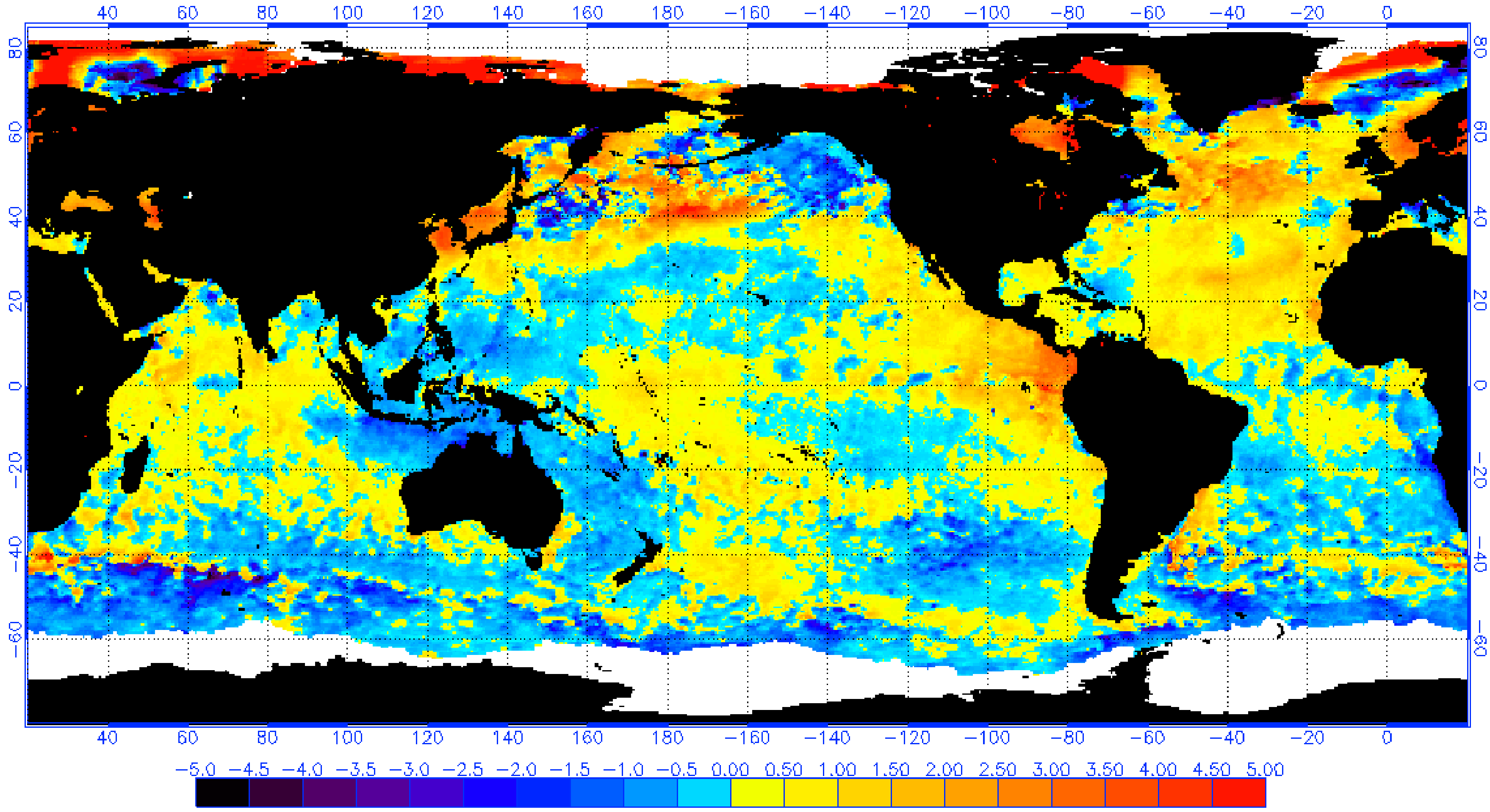


The changes in location of large areas of cold and warm water in the Pacific alter the path of the jet stream that provides the steering for storms across North America. During the cool phase, the PDO will steer the jet stream further north over the western United States resulting in decreased precipitation in the southwestern states over the next 20 or so years.

Understanding ocean-atmospheric phenomenon such as the Pacific Decadal Oscillation as part of global climate variability is critical not only to climate forecasting capabilities, but also to deconstructing and separating natural from anthropogenic factors influencing the global climate system.

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST – Climatology (C), 8/15/2006

(white regions indicate sea–ice)



An historical narrative on the Pacific Decadal Oscillation, interdecadal climate variability and ecosystem impacts

Report of a talk presented at the 20th NE Pacific Pink and Chum workshop, Seattle, WA, 22 March 2001

Steven R. Hare and Nathan J. Mantua

Abstract

The term Pacific Decadal Oscillation (PDO) was coined in 1997 (Mantua et al. 1997) to describe a mode of north Pacific climate variability that varies on a multi-decadal time scale. A number of independent studies being conducted at the time contributed to the realization that the PDO had widespread climatic and ecosystem impacts. This brief report is our perspective on how the PDO was identified and named. We also provide summaries of more recent work characterizing the PDO and interdecadal climate variability, and give several examples of climate induced variability in the ecosystems of the North Pacific.

Introduction

In the past decade, there has been an explosion in the awareness of the effect of climate variability on marine and terrestrial populations. Much of the interest stems from the growing concern about the warming of the planet in response to increased concentration of greenhouse gases and deforestation, and the resultant impact on plant and animal life. A direct method of assessing the potential impacts of global warming is by examining how populations respond to natural climate variability.

In the Pacific Ocean, the natural climate phenomenon termed El Niño-Southern Oscillation (ENSO) has long been recognized. The two phases of ENSO are generally termed El Niño (or warm phase) and La Niña (cool phase). Studies of ENSO-related impacts on marine ecosystems are numerous (e.g., Wooster and Fluharty (1985), Mysak (1986), Glantz (1996)). After the seasonal cycle, ENSO is the largest climate signal over most of the Pacific Ocean. While termed an oscillation, the alternation between El Niño and La Niña events is quite irregular, though generally occurring every 3 to 7 years with individual events usually lasting 8 to 15 months.

SEARCH
Go!

OVERVIEW
SCIENCE
-El Niño/La Niña & PDO
-Literature Database
-Monthly Time Series
-Science Objectives
-Practical Applications
-Scientific Investigations
-Data Sources
-The Tandem Mission
TECHNOLOGY
MISSIONS
NEWSROOM
EDUCATION
GALLERY

SCIENCE - El Niño/La Niña & PDO

PDO in the Press - News Items

Find the latest Pacific Decadal Oscillation press releases. Also, check the Pacific Decadal Oscillation news collected by the University of Washington group that discovered the PDO.

Other Pacific Decadal Oscillation News:

- Moody Pacific Unleashes Another Climate Mystery (NASA)
- Pacific Ocean Showing Signs of Major Shifts in the Climate (New York Times)
- Real Winters To Return, New NASA Data Suggest (Space.com)
- Winter winds whip up changes: Arctic forecasts signal long-term weather patterns (Boston Herald)
- Wacky weather ahead (Time)
- U.S May Be Entering New Weather Era (Washington Post)
- What's Up With the Weather (Newsweek)
- A Change in the weather? - Scientists say we may be heading back to the harsh conditions of yesteryear (US News & World Report)
- Southwest warned to plan for dry weather - Example of a societal benefit to understanding climate patterns (ENN news)

Ecological Applications, 14(2), 2004, pp. 425–442

DROUGHT AND PACIFIC DECADAL OSCILLATION LINKED TO FIRE OCCURRENCE IN THE INLAND PACIFIC NORTHWEST

Amy E. Hessl,[1,4] Don McKenzie,[2] and Richard Schellhaas[3]

[1]*Department of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506 USA*
[2]*Fire and Environmental Research Applications (FERA) Team, Pacific Wildland Fire Sciences Laboratory, USDA Forest Service, Seattle, Washington 98103 USA*
[3]*Wenatchee Forestry Sciences Laboratory, USDA Forest Service, Wenatchee, Washington 98801 USA*

Abstract. Historical variability of fire regimes must be understood within the context of climatic and human drivers of disturbance occurring at multiple temporal scales. We describe the relationship between fire occurrence and interannual to decadal climatic variability (Palmer Drought Severity Index [PDSI], El Niño/Southern Oscillation [ENSO], and the Pacific Decadal Oscillation [PDO]) and explain how land use changes in the 20th century affected these relationships. We used 1701 fire-scarred trees collected in five study sites in central and eastern Washington State (USA) to investigate current year, lagged, and low frequency relationships between composite fire histories and PDSI, PDO, and ENSO (using the Southern Oscillation Index [SOI] as a measure of ENSO variability) using superposed epoch analysis and cross-spectral analysis. Fires tended to occur during dry summers and during the positive phase of the PDO. Cross-spectral analysis indicates that percentage of trees scarred by fire and the PDO are spectrally coherent at 47 years, the approximate cycle of the PDO. Similarly, percentage scarred and ENSO are spectrally coherent at six years, the approximate cycle of ENSO. However, other results suggest that ENSO was only a weak driver of fire occurrence in the past three centuries. While drought and fire appear to be tightly linked between 1700 and 1900, the relationship between drought and fire occurrence was disrupted during the 20th century as a result of land use changes. We suggest that long-term fire planning using the PDO may be possible in the Pacific Northwest, potentially allowing decadal-scale management of fire regimes, prescribed fire, and vegetation dynamics.

Key words: climate; cross-spectral; drought; ENSO (El Niño/Southern Oscillation); fire history; Pacific Decadal Oscillation; Pacific Northwest; Pinus ponderosa; *SEA (superposed epoch analysis).*

Available online at www.sciencedirect.com

SCIENCE DIRECT®

Quaternary Research 59 (2003) 151–159

QUATERNARY RESEARCH

www.elsevier.com/locate/yqres

Influence of the Pacific Decadal Oscillation on the climate of the Sierra Nevada, California and Nevada

Larry Benson,*[,a] Braddock Linsley,[b] Joe Smoot,[c] Scott Mensing,[d] Steve Lund,[e] Scott Stine,[f] and Andre Sarna-Wojcicki[g]

[a] *U.S. Geological Survey, 3215 Marine Street, Boulder, CO 80303-1066, USA*
[b] *Earth and Atmospheric Sciences, State University of New York, 1400 Washington Avenue, Albany, NY 12222-0001, USA*
[c] *U.S. Geological Survey, MS 955, Reston, VA 22090, USA*
[d] *Department of Geography, University of Nevada, Reno, NV 89557, USA*
[e] *Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089, USA*
[f] *California State University, Hayward, CA 94542, USA*
[g] *U.S. Geological Survey, MS 975, Middlefield Road, Menlo Park, CA 94025, USA*

Received 4 June 2002

Abstract

Mono Lake sediments have recorded five major oscillations in the hydrologic balance between A.D. 1700 and 1941. These oscillations can be correlated with tree-ring-based oscillations in Sierra Nevada snowpack. Comparison of a tree-ring-based reconstruction of the Pacific Decadal Oscillation (PDO) index (D'Arrigo et al., 2001) with a coral-based reconstruction of Subtropical South Pacific sea-surface temperature (Linsley et al., 2000) indicates a high degree of correlation between the two records during the past 300 yr. This suggests that the PDO has been a pan-Pacific phenomena for at least the past few hundred years. Major oscillations in the hydrologic balance of the Sierra Nevada correspond to changes in the sign of the PDO with extreme droughts occurring during PDO maxima. Four droughts centered on A.D. 1710, 1770, 1850, and 1930 indicate PDO-related drought reoccurrence intervals ranging from 60 to 80 yr.

Keywords: PDO; Pacific Decadal Oscillation; Mono Lake; Sierra Nevada

A Smoking Gun?

Maybe just an Inconvenient Truth!

Climate
Montana
Office